AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage supplied by one of a 5VDC power supply and a ~~of approximately~~ 12VDC power supply ~~or less~~ to a high voltage of one of ~~from~~ approximately 140VDC ~~to~~ and approximately 280VDC; and

an amplification means driven by the high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the output signal of said D-class amplifier.

2. (currently amended): A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a power supply which supplies voltage to the sine wave oscillation means to activate the sine wave oscillation means; ~~and~~

control means for implementing variable frequency control over three or more different frequencies at the time of activation of said sine wave oscillation means; and

a voltage detection circuit which detects when the voltage to the sine wave oscillation means is supplied at power up and provides a signal to the control means indicative of a detection of voltage.

3. (currently amended) A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage ;

an amplification means composed of a D-class amplifier driven by high voltage generated by said voltage-boosting means for subjecting a signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification, and a low-pass filter for demodulating the output signal of said D-class amplifier; said amplification means being driven at high voltage generated by said voltage-boosting means and amplifying the signal supplied as output from said sine wave oscillation means for driving said piezoelectric element by a high-voltage sine wave;

a power supply which supplies voltage to the sine wave oscillation means to activate the sine wave oscillation means; ~~and~~

a control means for implementing variable frequency control over three or more different frequencies at the time of activation of said sine wave oscillation means; and

a voltage detection circuit which detects when the voltage to the sine wave oscillation means is supplied at power up and provides a signal to the control means indicative of a detection of voltage.

4. (previously presented): A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means composed of a D-class amplifier driven by high voltage generated

by said voltage-boosting means for subjecting a signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification , and low-pass filter for demodulating the output signal of said D-class amplifier; said amplification means being driven at high voltage generated by said voltage-boosting means and amplifying the signal supplied as output from said sine wave oscillation means for driving said piezoelectric element by a high-voltage sine wave;

a temperature sensing means for sensing temperature of a heat-generating body; and

a control means for one of increasing the signal amplitude of said sine wave oscillation means when the temperature of the heat-generating body is increased and decreasing the signal amplitude of the sine wave oscillation means when the temperature of said heat-generating body is decreased, based on the sensed temperature.

5. (previously presented): A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a temperature sensing means for sensing temperature of a heat-generating body; and

a control means for one of increasing the signal amplitude of said sine wave oscillation means when the temperature of the heat-generating body is increased and decreasing the signal amplitude of said sine wave oscillation means when the temperature of said heat-generating body is decreased, based on the sensed temperature;

wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the output signal of said D-class amplifier.

6. (currently amended): A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a power supply which supplies voltage to the sine wave oscillation means to activate the sine wave oscillation means;

a first control means for implementing variable frequency control at the time of activation of said sine wave oscillation means;

a voltage detection circuit which detects when the voltage to the sine wave oscillation means is supplied at power up and provides a signal to the first control means indicative of a detection of voltage;

a temperature sensing means for sensing temperature; and

a second control means for adjusting the signal amplitude of said sine wave oscillation means in accordance with the sensed temperature of said temperature sensing means.

7. (currently amended): A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a power supply which supplies voltage to the sine wave oscillation means to activate the sine wave oscillation means;

a first control means for implementing variable frequency control at the time of activation of said sine wave oscillation means;

a voltage detection circuit which detects when the voltage to the sine wave oscillation means is supplied at power up and provides a signal to the first control means indicative of a

detection of voltage;

a temperature sensing means for sensing temperature; and

a second control means for adjusting the signal amplitude of said sine wave oscillation means in accordance with the sensed temperature of said temperature sensing means;

wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the output signal of said D-class amplifier.

8. (currently amended): A cooling system comprising:

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage supplied by one of a 5VDC power supply ~~of approximately~~ and a 12VDC power supply ~~or less~~ to a high voltage of one of ~~from~~ approximately 140VDC ~~to~~ and approximately 280VDC; and

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the output signal of said D-class amplifier;

a heat sink that contacts a heat-generating body;

a radiator for radiating heat to the outside;

coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; and

a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

9. (currently amended): A cooling system comprising:

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a power supply which supplies voltage to the sine wave oscillation means to activate the sine wave oscillation means; ~~and~~

control means for implementing variable frequency control over three or more different frequencies at the time of activation of said sine wave oscillation means; and

a voltage detection circuit which detects when the voltage to the sine wave oscillation means is supplied at power up and provides a signal to the control means indicative of a detection of voltage;

a heat sink that contacts a heat-generating body;

a radiator for radiating heat to the outside;

coolant circulation passages connected such that coolant circulates between said heat sink and said radiator;

a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

10. (currently amended): A cooling system comprising:

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a power supply which supplies voltage to the sine wave oscillation means to activate the sine wave oscillation means; ~~and~~

a control means for implementing variable frequency control at the time of activation of said sine wave oscillation means; and

a voltage detection circuit which detects when the voltage to the sine wave oscillation means is supplied at power up and provides a signal to the control means indicative of a detection of voltage;

wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the output signal of said D-class amplifier;

a heat sink that contacts a heat-generating body;

a radiator for radiating heat to the outside;

coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; and

a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

11. (previously presented): A cooling system comprising:

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a temperature sensing means for sensing temperature of a heat-generating body; and

a control means for one increasing the signal amplitude of said sine wave oscillation means when the temperature of the heat-generating body is increased and decreasing the signal amplitude of the sine wave oscillation means when the temperature of said heat-generating body is decreased, based on the sensed temperature;

a heat sink that contacts the heat-generating body;

a radiator for radiating heat to the outside;

coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; and

a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

12. (previously presented): A cooling system comprising:

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a temperature sensing means for sensing temperature of a heat-generating body; and

a control means for one of increasing the signal amplitude of said sine wave oscillation means when the temperature of said heat-generating body is increased and decreasing the signal amplitude of said sine wave oscillation means when the temperature of said heat-generating body is decreased, based on the sensed temperature;

wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said

sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the output signal of said D-class amplifier;

a heat sink that contacts the heat-generating body;

a radiator for radiating heat to the outside;

coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; and

a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

13. (currently amended): A cooling system comprising:

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a power supply which supplies voltage to the sine wave oscillation means to activate the sine wave oscillation means;

a first control means for implementing variable frequency control at the time of activation of said sine wave oscillation means;

a voltage detection circuit which detects when the voltage to the sine wave oscillation means is supplied at power up and provides a signal to the first control means indicative of a detection of voltage;

a temperature sensing means for sensing temperature; and

a second control means for adjusting the signal amplitude of said sine wave oscillation means in accordance with the sensed temperature of said temperature sensing means;

a heat sink that contacts a heat-generating body;

a radiator for radiating heat to the outside;

coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; and

a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

14. (currently amended): A cooling system comprising:

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a power supply which supplies voltage to the sine wave oscillation means to activate the sine wave oscillation means;

a first control means for implementing variable frequency control at the time of activation of said sine wave oscillation means;

a voltage detection circuit which detects when the voltage to the sine wave oscillation means is supplied at power up and provides a signal to the first control means indicative of a detection of voltage;

a temperature sensing means for sensing temperature; and

a second control means for adjusting the signal amplitude of said sine wave oscillation means in accordance with the sensed temperature of said temperature sensing means;

wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the output signal of said D-class amplifier;

a heat sink that contacts a heat-generating body;

a radiator for radiating heat to the outside;

coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; and

a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

15. (cancelled)

16. (currently amended): The piezoelectric pump drive circuit according to claim 2~~15~~, wherein the control means implements the variable frequency control over three or more different frequencies at the time of activation of the sine wave oscillation means based on the provided signal.

17. (previously presented): The piezoelectric pump drive circuit according to claim 16, further comprising:

a temperature sensing means for sensing temperature of a heat generating body, which is different from the piezoelectric element; and

another control means for adjusting signal amplitude of the sine wave oscillation means based on the sensed temperature.

18. (currently amended): The piezoelectric pump drive circuit according to claim 2, wherein the voltage-boosting means converts the low-voltage power supply to the high voltage of one of ~~from~~ approximately 140VDC and~~to~~ approximately 280VDC.